



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/597,227	07/17/2006	Kenneth E. Welker	14.0250-PCT-US	7982

28116 7590 11/29/2010
WesternGeco L.L.C.
Kevin McEnaney, IP Dept
10001 Richmond Avenue
HOUSTON, TX 77042-4299

EXAMINER

BREIER, KRYSTINE E

ART UNIT	PAPER NUMBER
----------	--------------

3663

NOTIFICATION DATE	DELIVERY MODE
-------------------	---------------

11/29/2010

ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

lgoldsmith@slb.com
WG-IP@slb.com



UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/597,227
Filing Date: July 17, 2006
Appellant(s): WELKER ET AL.

Jeffrey A. Pyle
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 10/12/2010 appealing from the Office action mailed 12/29/2009.

(1) Real Party in Interest

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The following is a list of claims that are rejected and pending in the application: 1-69.

(4) Status of Amendments After Final

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

(5) Summary of Claimed Subject Matter

The examiner has no comment on the summary of claimed subject matter contained in the brief.

(6) Grounds of Rejection to be Reviewed on Appeal

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds of rejection (if any) listed under the

Art Unit: 3663

subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

(7) Claims Appendix

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

(8) Evidence Relied Upon

5640325	Banbrook	06-1997
6625083	Vandenbroucke	09-2003
6011752	Ambs	01-2000
5739787	Burke	04-1998

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-5, 7-8, 10-19, 21-30, and 32-69 are rejected under 35 U.S.C. 103(a) as being unpatentable over Banbrook (5640325) in view of Vandenbroucke (6625083).

Art Unit: 3663

With regards to claim 1, Banbrook teaches an apparatus for use in a marine seismic survey (abstract; Col 1), comprising: a seismic survey object (Col 3, line 55 – Col 4, line 36; Fig 1); and an inertial measurement unit (Fig 1: 20,22, 24,26,28; Fig 2: 42,44,46,48,50) coupled to the seismic survey object at a known point and from which the movement of the seismic survey object can be measured during a seismic survey such that the position of the known point during the marine seismic survey can be determined (Col 3, line 61 to Col 4, line 54; Col 5, lines 8-44). However Banbrook does not teach a short baseline acoustic system or ultrashort baseline acoustic system used with the seismic survey object and inertial measurement unit.

Vandenbroucke discloses a marine seismic survey system used in seismic surveys that includes hydrophones (the sensor used in Banbrook) (Column 3, Line 43 to Column 4, Line 36). Although Banbrook discloses using the acoustic receivers for reflection surveys for locating without specifically mentioning that it is seismic surveying, Vandenbroucke teaches that it is known that the same sensors are used to take data in seismic reflection surveys. Vandenbroucke, like Banbrook, is also concerned with determining the position of the marine seismic survey equipment (Column 1, Line 60 to Column 2, Line 10; Column 4, Lines 4-21). Vandenbroucke teaches that it is known to use short baseline or ultrashort baseline acoustic positioning systems in addition to other positioning means with the marine seismic survey system in order to determine the relative positions of each survey component to the other components (Column 1, Line 60 to Column 2, Line 10; Column 4, Lines 4-21).

Art Unit: 3663

It would have been obvious to one of ordinary skill in the art of geophysics at the time of the invention to modify the system of Banbrook with the short baseline or ultrashort baseline acoustic positioning systems of Vandenbroucke since such a modification would have improved the accuracy of the locations determined for the survey components, thus improving the accuracy of the subsurface map created from the collected data. It is generally known in the art to combine multiple position determination devices within a single survey system to improve the accuracy of the positioning. As knowledge of the positions of the seismic apparatus is of utmost importance to the accuracy of the survey, it would have been obvious to one of ordinary skill in the art to ensure the accuracy of the position determination by combining the teachings of both references to create an improved system.

With regard to claim 2, Banbrook discloses that the seismic survey object comprises one of a seismic cable, a seismic receiver, a steering device, and a seismic source (Column 3, Line 55 to Column 4, Line 21).

With regard to claim 3, Banbrook discloses that the seismic cable comprises one of a streamer and an ocean bottom cable (streamer) (Fig. 1) (Column 3, Line 55 to Column 4, Line 10).

With regard to claim 4, Banbrook discloses that the seismic cable includes one of a sensor module, a steering device, and an inertial positioning device in which the inertial measurement unit is housed (Column 3, Line 55 to Column 4, Line 36; Column 5).

Art Unit: 3663

With regard to claim 5, Banbrook discloses that the seismic cable includes a plurality of acoustic receivers (Column 1; Column 3, Lines 60-65).

With regard to claim 7, Banbrook does not disclose a seismic source that comprises at least one of an air gun and a vibrator. Vandenbroucke teaches that it is known to use seismic sources that are airguns in marine seismic surveys (Column 4, Lines 21-30). It would have been obvious to modify Banbrook to include an airgun source as taught by Vandenbroucke in order to be able to emit acoustic waves that can be used in the reflection surveys.

With regard to claim 8, Banbrook discloses an inertial positioning device in which the inertial measurement unit is housed (Column 3, Line 64 to Column 5, Line 65).

With regard to claim 10, Banbrook discloses that the inertial measurement unit comprises a plurality of accelerometers and gyroscopes (Column 5, Lines 1-8).

With regard to claim 11, Banbrook discloses that the inertial measurement unit comprises a micro-electromechanical inertial measurement unit (Column 5, Lines 1-6).

With regard to claim 12, Banbrook discloses that the inertial positioning device comprises an acoustic node determined by either an acoustic source or receiver (Column 1; Column 3, Line 55 to Column 4, Line 21).

With regard to claim 13, Vandenbroucke teaches that the acoustically determined point in marine seismic spreads comprises one of an ultra-short baseline acoustic system, a short baseline acoustic system, or a distance measurement acoustic system (Column 1, Line 60 to Column 2, Line 10; Column 4, Lines 4-21).

Art Unit: 3663

With regard to claim 14, Banbrook discloses a marine seismic spread (abstract; Column 1), comprising: a plurality of seismic survey objects, including a plurality of acoustic receivers distributed over a survey area from at least one known point (Fig. 1) (Column 1, Lines 15-33; Column 3, Line 55 to Column 4, Line 36); and a plurality of inertial positioning devices (Fig 1: 20,22, 24,26,28) or (Fig 2: 42,44,46,48,50) coupled to the seismic survey objects at known points and capable of taking inertial measurements of the movement of the seismic survey objects relative to the known point such that the position of the known points during the marine seismic survey can be determined (Column 3, Line 61 to Column 4, Line 54; Column 5, Lines 8-44).

Banbrook does not disclose a short baseline acoustic system used with the seismic survey object and inertial measurement unit. Vandenbroucke discloses a marine seismic survey system used in seismic surveys that includes hydrophones (the sensor used in Banbrook) (Column 3, Line 43 to Column 4, Line 36). Although Banbrook discloses using the acoustic receivers for reflection surveys for locating without specifically mentioning that it is seismic surveying, Vandenbroucke teaches that it is known that the same sensors are used to take data in seismic reflection surveys. Vandenbroucke, like Banbrook, is also concerned with determining the position of the marine seismic survey equipment (Column 1, Line 60 to Column 2, Line 10; Column 4, Lines 4-21). Vandenbroucke teaches that it is known to use short baseline or ultrashort baseline acoustic positioning systems in addition to other positioning means with the marine seismic survey system in order to determine the relative positions of each survey component to the other components (Column 1, Line 60 to Column 2, Line 10;

Art Unit: 3663

Column 4, Lines 4-21). It would have been obvious to modify Banbrook to include using short baseline or ultrashort baseline acoustic positioning systems with the survey components as taught by Vandenbroucke in order to determine the position of the survey components relative to the vessel or other components in the survey so that the positions will be known for processing the data acquired.

Banbrook does not disclose that the survey objects include at least one seismic source in addition to the receivers. Vandenbroucke teaches that it is known to include a seismic source towed by a boat in order to emit acoustic waves for use in the seismic survey (Column 4, Lines 21-30). It would have been obvious to modify Banbrook to include a seismic source towed by the vessel in addition to the receivers as taught by Vandenbroucke in order to be able to emit waves so that reflections of the waves from the survey area can be obtained by the receivers to image or locate objects in the survey area.

With regard to claim 15, Banbrook discloses that the plurality of seismic survey objects include a plurality of seismic cables comprised of the acoustic sources and the inertial positioning devices (Figs. 1-2) (Column 4).

With regard to claim 16, Banbrook discloses that the seismic cables comprise a plurality of streamers (Column 3, Line 57 to Column 4, Line 21) (Figs. 1-2).

With regard to claim 17, Banbrook discloses that the seismic survey objects include a plurality of inertial positioning devices (Column 3, Line 61 to Column 4, Line 54; Column 5, Lines 8-44).

Art Unit: 3663

With regard to claim 18, Banbrook discloses that the plurality of acoustic receivers comprise a plurality of hydrophones or geophones (Column 1, Lines 15-33).

With regard to claim 19, Banbrook discloses that the inertial measurement unit is housed in an inertial positioning device housed (Column 3, Line 64 to Column 5, Line 65).

With regard to claim 21, Banbrook discloses that the inertial measurement unit comprises a plurality of accelerometers and gyroscopes (Column 5, Lines 1-8).

With regard to claim 22, Banbrook discloses that the inertial measurement unit comprises a micro-electromechanical inertial measurement unit (Column 5, Lines 1-6).

With regard to claim 23, Banbrook discloses that the inertial positioning device comprises an acoustic node determined by either an acoustic source or receiver (Column 1; Column 3, Line 55 to Column 4, Line 21).

With regard to claim 24, Vandembroucke teaches that the acoustically determined point in marine seismic spreads comprises one of an ultra-short baseline acoustic system, a short baseline acoustic system, or a distance measurement acoustic system (Column 1, Line 60 to Column 2, Line 10; Column 4, Lines 4-21).

With regard to claim 25, Banbrook discloses an apparatus for use in a marine seismic survey (abstract; Column 1), comprising: a seismic survey cable (Fig. 1) (Column 3, Line 55 to Column 4, Line 36); and an inertial measurement unit (Fig 1: 20,22, 24,26,28) or (Fig 2: 42,44,46,48,50) coupled to the seismic survey cable at a known point and from which the movement of the seismic survey cable can measured during a seismic survey such that the position of the known point during the marine

Art Unit: 3663

seismic survey can be determined (Column 3, Line 61 to Column 4, Line 54; Column 5, Lines 8-44).

Banbrook does not disclose a short baseline acoustic system used with the seismic survey object and inertial measurement unit. Vandenbroucke discloses a marine seismic survey system used in seismic surveys that includes hydrophones (the sensor used in Banbrook) (Column 3, Line 43 to Column 4, Line 36). Although Banbrook discloses using the acoustic receivers for reflection surveys for locating without specifically mentioning that it is seismic surveying, Vandenbroucke teaches that it is known that the same sensors are used to take data in seismic reflection surveys. Vandenbroucke, like Banbrook, is also concerned with determining the position of the marine seismic survey equipment (Column 1, Line 60 to Column 2, Line 10; Column 4, Lines 4-21). Vandenbroucke teaches that it is known to use short baseline or ultrashort baseline acoustic positioning systems in addition to other positioning means with the marine seismic survey system in order to determine the relative positions of each survey component to the other components (Column 1, Line 60 to Column 2, Line 10; Column 4, Lines 4-21). It would have been obvious to modify Banbrook to include using short baseline or ultrashort baseline acoustic positioning systems with the survey components as taught by Vandenbroucke in order to determine the position of the survey components relative to the vessel or other components in the survey so that the positions will be known for processing the data acquired.

Art Unit: 3663

With regard to claim 26, Banbrook discloses that the seismic cable comprises one of a streamer and an ocean bottom cable (streamer) (Fig. 1) (Column 3, Line 55 to Column 4, Line 10).

With regard to claim 27, Banbrook discloses that the seismic cable includes one of a sensor module, a steering device, and an inertial positioning device in which the inertial measurement unit is housed (Column 3, Line 55 to Column 4, Line 36; Column 5).

With regard to claim 28, Banbrook discloses that the seismic cable includes a plurality of acoustic receivers (Column 1; Column 3, Lines 60-65).

With regard to claim 29, Banbrook discloses that the plurality of acoustic receivers comprise a plurality of hydrophones or a plurality of geophones Column 1, Lines 15-33).

With regard to claim 30, Banbrook discloses that the inertial measurement unit is housed within an inertial positioning device (Column 3, Line 64 to Column 5, Line 65).

With regard to claim 32, Banbrook discloses that the inertial measurement unit comprises a plurality of accelerometers and gyroscopes (Column 5, Lines 1-8).

With regard to claim 33, Banbrook discloses that the inertial measurement unit comprises a micro-electromechanical inertial measurement unit (Column 5, Lines 1-6).

With regard to claim 34, Banbrook discloses that the inertial positioning device comprises an acoustic node determined by either an acoustic source or receiver (Column 1; Column 3, Line 55 to Column 4, Line 21).

Art Unit: 3663

With regard to claim 35, Vandenbroucke teaches that the acoustically determined point in marine seismic spreads comprises one of an ultra-short baseline acoustic system, a short baseline acoustic system, or a distance measurement acoustic system (Column 1, Line 60 to Column 2, Line 10; Column 4, Lines 4-21).

With regard to claim 36, Banbrook discloses a method for use in a marine seismic survey (abstract; Column 1), comprising: taking inertial measurements of movement of selected points (Fig 1: 20,22,24,26,28) on a seismic spread relative to at least one known point (Fig. 1) (Column 3, Line 61 to Column 4, Line 54; Column 5, Lines 8-44); and applying the inertial measurements to the known point to determine the positions of the selected points (Column 3, Line 61 to Column 4, Line 54; Column 5, Lines 8-44).

Banbrook does not disclose a short baseline acoustic system used with the seismic survey objects and inertial measurements. Vandenbroucke discloses a marine seismic survey system used in seismic surveys that includes hydrophones (the sensor used in Banbrook) (Column 3, Line 43 to Column 4, Line 36). Although Banbrook discloses using the acoustic receivers for reflection surveys for locating without specifically mentioning that it is seismic surveying, Vandenbroucke teaches that it is known that the same sensors are used to take data in seismic reflection surveys. Vandenbroucke, like Banbrook, is also concerned with determining the position of the marine seismic survey equipment (Column 1, Line 60 to Column 2, Line 10; Column 4, Lines 4-21). Vandenbroucke teaches that it is known to use short baseline or ultrashort baseline acoustic positioning systems in addition to other positioning means with the

Art Unit: 3663

marine seismic survey system in order to determine the relative positions of each survey component to the other components (Column 1, Line 60 to Column 2, Line 10; Column 4, Lines 4-21). It would have been obvious to modify Banbrook to include using short baseline or ultrashort baseline acoustic positioning systems with the survey components as taught by Vandenbroucke in order to determine the position of the survey components relative to the vessel or other components in the survey so that the positions will be known for processing the data acquired.

With regard to claim 37, Banbrook discloses that taking the inertial measurements includes taking the inertial measurements during at least one of deploying the spread, retrieving the spread and conducting a survey (Column 4, Lines 40-54).

With regard to claim 38, Banbrook does not disclose supplementing the inertial measurements. Vandenbroucke teaches that it is known to supplement positioning measurements of marine seismic survey equipment (Column 4). It would have been obvious to modify Banbrook to include supplementing the inertial measurements as taught by Vandenbroucke in order to obtain accurate position measurements of the survey equipment in relation to the other equipment used in the survey.

With regard to claim 39, Vandenbroucke teaches that supplementing the inertial measurements comprises at least one of calibrating the positions using a coordinate history determined from acoustic ranging signals and integrating one dimensional measures (Column 4).

Art Unit: 3663

With regard to claim 40, Banbrook discloses deploying the seismic spread at the known point (Column 1; Column 2, Line 41 to Column 3, Line 23; Column 4, Line 55 to Column 5, Line 26).

With regard to claim 41, Banbrook discloses that deploying the seismic spread at the known point includes one of deploying the seismic spread to the bottom of a body of water and deploying the seismic spread near to the surface of the body of water (discloses deploying near the surface) (Figs. 1-2) (Column 1).

With regard to claim 42, Banbrook discloses that deploying the seismic spread at the known point includes deploying the seismic spread in one of saltwater, fresh water, and brackish water (Column 1).

With regard to claim 43, Banbrook discloses housing an inertial measurement unit in a seismic survey object (Column 3, Line 64 to Column 5, Line 65).

With regard to claim 44, Banbrook discloses that housing the inertial measurement unit in a seismic survey object includes housing the inertial measurement unit in one of a seismic cable, a seismic receiver, a steering device, and a seismic source (Column 3, Line 55 to Column 4, Line 36; Column 5).

With regard to claim 45, Banbrook discloses that taking inertial measurements of the movement of selected points on the seismic spread includes taking inertial measurements of the movement of selected seismic survey objects (Column 3, Line 55 to Column 5, line 10).

With regard to claim 46, Banbrook discloses that taking inertial measurements of the movement of selected seismic survey objects includes taking inertial measurements

Art Unit: 3663

of the movement of at least one of a seismic cable, a seismic receiver, a steering device, and a seismic source (Column 3, Line 55 to Column 5, Line 10).

With regard to claim 47, Banbrook discloses that the seismic cable includes seismic survey objects having known relative orientations with respect to the selected points on the seismic cable, and the method further comprises determining positions of the selected seismic survey objects based on the determined positions of the selected points and the known relative orientations (Column 4, Lines 11-54; Column 5, Lines 8-65; Column 6, Lines 44-65).

With regard to claim 48, Banbrook discloses a method for use in a marine seismic survey (abstract; Column 1), comprising: deploying a seismic cable at a known point (Figs. 1-2) (Column 3, Line 55 to Column 4, Line 21); taking inertial measurements of movement of selected points on the seismic cable relative to the known point during the deployment (Column 3, Line 55 to Column 5, Line 10; Column 5, Line 45 to Column 6, Line 18); and applying the inertial measurements to the known point to determine the positions of the selected points (Column 3, Line 55 to Column 5, Line 10; Column 5, Line 45 to Column 6, Line 18).

Banbrook does not disclose a short baseline acoustic system used with the seismic survey cable and inertial measurements. Vandenbroucke discloses a marine seismic survey system used in seismic surveys that includes hydrophones (the sensor used in Banbrook) (Column 3, Line 43 to Column 4, Line 36). Although Banbrook discloses using the acoustic receivers for reflection surveys for locating without specifically mentioning that it is seismic surveying, Vandenbroucke teaches that it is

Art Unit: 3663

known that the same sensors are used to take data in seismic reflection surveys.

Vandenbroucke, like Banbrook, is also concerned with determining the position of the marine seismic survey equipment (Column 1, Line 60 to Column 2, Line 10; Column 4, Lines 4-21). Vandenbroucke teaches that it is known to use short baseline or ultrashort baseline acoustic positioning systems in addition to other positioning means with the marine seismic survey system in order to determine the relative positions of each survey component to the other components (Column 1, Line 60 to Column 2, Line 10; Column 4, Lines 4-21). It would have been obvious to modify Banbrook to include using short baseline or ultrashort baseline acoustic positioning systems with the survey components as taught by Vandenbroucke in order to determine the position of the survey components relative to the vessel or other components in the survey so that the positions will be known for processing the data acquired.

With regard to claim 49, Banbrook discloses that the seismic cable includes seismic survey objects having known relative orientations with respect to the selected points on the seismic cable, and the method further comprises determining positions of the selected seismic survey objects based on the determined positions of the selected points and the known relative orientations (Column 4, Lines 11-54; Column 5, Lines 8-65; Column 6, Lines 44-65).

With regard to claim 50, Banbrook discloses that deploying the seismic cable comprises one of deploying the seismic cable to the bottom of the water and deploying the seismic cable near to the surface of the water (Figs. 1-2) (Column 1).

Art Unit: 3663

With regard to claim 51, Banbrook does not disclose supplementing the inertial measurements. Vandenbroucke teaches that it is known to supplement positioning measurements of marine seismic survey equipment (Column 4). It would have been obvious to modify Banbrook to include supplementing the inertial measurements as taught by Vandenbroucke in order to obtain accurate position measurements of the survey equipment in relation to the other equipment used in the survey.

With regard to claim 52, Vandenbroucke teaches that supplementing the inertial measurements comprises at least one of calibrating the positions using a coordinate history determined from acoustic ranging signals and integrating one dimensional measures (Column 4).

With regard to claim 53, Banbrook discloses that deploying the seismic cable at the known point includes one of deploying the seismic cable to the bottom of a body of water and deploying the seismic cable near to the surface of the body of water (Column 1) (Figs. 1-2).

With regard to claim 54, Banbrook discloses that deploying the seismic cable at the known point includes deploying the seismic cable in one of saltwater, fresh water, and brackish water (Column 1).

With regard to claim 55, Banbrook discloses housing an inertial measurement unit in a seismic survey object comprising a portion of the seismic cable (Column 3, Line 64 to Column 5, Line 65).

With regard to claim 56, Banbrook discloses that housing the inertial measurement unit in a seismic survey object includes housing the inertial measurement

Art Unit: 3663

unit in one of a seismic receiver, a steering device, and a seismic source (Column 3, Line 55 to Column 4, Line 36; Column 5).

With regard to claim 57, Banbrook discloses that taking inertial measurements of the movement of selected points on the seismic cable includes taking inertial measurements of the movement of selected seismic survey objects comprising a portion of the seismic cable (Column 3, Line 55 to Column 5, line 10) (Figs. 1-2).

With regard to claim 58, Banbrook discloses that taking inertial measurements of the movement of selected seismic survey objects includes taking inertial measurements of the movement of at least one of a seismic cable, a seismic receiver, a steering device, and a seismic source (Column 3, Line 55 to Column 5, Line 10).

With regard to claim 59, Banbrook discloses a method for use in a marine seismic survey (abstract; Column 1), comprising: conducting a survey with a seismic spread deployed from at least one known point ((Figs. 1-2) Column 3, Line 55 to Column 4, Line 21); taking inertial measurements of movement of selected points on the seismic spread relative to the known point during the conduct of the seismic survey (Column 3, Line 55 to Column 5, Line 10; Column 5, Line 45 to Column 6, Line 18); and applying the inertial measurements to the known point to determine the positions of the selected points (Column 3, Line 55 to Column 5, Line 10; Column 5, Line 45 to Column 6, Line 18).

Banbrook does not disclose a short baseline acoustic system used with the seismic survey spread and inertial measurements. Vandembroucke discloses a marine seismic survey system used in seismic surveys that includes hydrophones (the sensor

Art Unit: 3663

used in Banbrook) (Column 3, Line 43 to Column 4, Line 36). Although Banbrook discloses using the acoustic receivers for reflection surveys for locating without specifically mentioning that it is seismic surveying, Vandenbroucke teaches that it is known that the same sensors are used to take data in seismic reflection surveys. Vandenbroucke, like Banbrook, is also concerned with determining the position of the marine seismic survey equipment (Column 1, Line 60 to Column 2, Line 10; Column 4, Lines 4-21). Vandenbroucke teaches that it is known to use short baseline or ultrashort baseline acoustic positioning systems in addition to other positioning means with the marine seismic survey system in order to determine the relative positions of each survey component to the other components (Column 1, Line 60 to Column 2, Line 10; Column 4, Lines 4-21). It would have been obvious to modify Banbrook to include using short baseline or ultrashort baseline acoustic positioning systems with the survey components as taught by Vandenbroucke in order to determine the position of the survey components relative to the vessel or other components in the survey so that the positions will be known for processing the data acquired.

With regard to claim 60, Banbrook does not disclose supplementing the inertial measurements. Vandenbroucke teaches that it is known to supplement positioning measurements of marine seismic survey equipment (Column 4). It would have been obvious to modify Banbrook to include supplementing the inertial measurements as taught by Vandenbroucke in order to obtain accurate position measurements of the survey equipment in relation to the other equipment used in the survey.

Art Unit: 3663

With regard to claim 61, Vandenbroucke teaches that supplementing the inertial measurements comprises at least one of calibrating the positions using a coordinate history determined from acoustic ranging signals and integrating one dimensional measures (Column 4).

With regard to claim 62, Banbrook discloses deploying the seismic spread at the known point (Figs. 1-2) (Column 3, Line 55 to Column 4, Line 21).

With regard to claim 63, Banbrook discloses that deploying the seismic cable at the known point includes one of deploying the seismic cable to the bottom of a body of water and deploying the seismic cable near to the surface of the body of water (Column 1) (Figs. 1-2).

With regard to claim 64, Banbrook discloses that deploying the seismic cable at the known point includes deploying the seismic cable in one of saltwater, fresh water, and brackish water (Column 1).

With regard to claim 65, Banbrook discloses housing an inertial measurement unit in a seismic survey object comprising a portion of the seismic cable (Column 3, Line 64 to Column 5, Line 65).

With regard to claim 66, Banbrook discloses that housing the inertial measurement unit in a seismic survey object includes housing the inertial measurement unit in one of a seismic receiver, a steering device, and a seismic source (Column 3, Line 55 to Column 4, Line 36; Column 5).

With regard to claim 67, Banbrook discloses that taking inertial measurements of the movement of selected points on the seismic cable includes taking inertial

Art Unit: 3663

measurements of the movement of selected seismic survey objects comprising a portion of the seismic cable (Column 3, Line 55 to Column 5, line 10) (Figs. 1-2).

With regard to claim 68, Banbrook discloses that taking inertial measurements of the movement of selected seismic survey objects includes taking inertial measurements of the movement of at least one of a seismic cable, a seismic receiver, a steering device, and a seismic source (Column 3, Line 55 to Column 5, Line 10).

With regard to claim 69, Banbrook discloses that the seismic cable includes seismic survey objects having known relative orientations with respect to the selected points on the seismic cable, and the method further comprises determining positions of the selected seismic survey objects based on the determined positions of the selected points and the known relative orientations (Column 4, Lines 11-54; Column 5, Lines 8-65; Column 6, Lines 44-65).

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Banbrook in view of Vandenbroucke as applied above, and further in view of Ambs (6011752).

With regard to claim 6, Banbrook does not disclose a steering device that comprises one of a Q-fin and a bird. Banbrook discloses inertial measurement units on the cable, but does not disclose that the cable also includes steering devices where the inertial measurements units could be. Ambs teaches that it is known to include steering devices of birds that include position measurement equipment on seismic streamers (abstract; Columns 5-6). It would have been obvious to modify Banbrook to include birds on the streamer as taught by Ambs in order to be able to be able to control the position of the streamer so that it is at desired positions for the survey.

Art Unit: 3663

Claims 9, 20, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Banbrook in view of Vandenbroucke as applied above, and further in view of Burke (5739787).

With regard to claims 9, 20 and 31, Banbrook discloses that the inertial positioning device further comprises: a power system for the inertial measurement unit (Column 4, Line 61 to Column 5, Line 40); a communication interface (communication back to the vessel) (Column 4, Line 61 to Column 5, Line 40); but does not disclose a battery powering the power system and the communication interface.

Banbrook discloses inertial measurement units, but does not disclose specifics as to how these sensors are powered. Burke teaches that it is known to power inertial measurement devices using battery power (Column 7, Line 38 to Column 8, Line 30). It would have been obvious to modify Banbrook to include a battery to power the units as taught by Burke in order to have a portable and local power source for each unit.

(10) Response to Argument

Seismic exploration of the subsurface can be performed in several different ways. One such way is pertinent to the present application. Marine seismic surveying generally entails the use of a vessel towing a series of cables, known in the art as streamers. Alternatively, the streamers may be placed on the ocean floor. Sensors are attached to or embedded in the streamers. These sensors are generally pressure sensors, also known as hydrophones. Velocity sensors, known as geophones; acceleration sensors, known as accelerometers; and multicomponent sensors, which

Art Unit: 3663

contain various combinations of hydrophones, geophones, and accelerometers, may also be used.

A source, generally an air gun, emits a pressure wave into the subsurface, which is reflected of the various interfaces between layers which have difference impedance characteristics. The reflections are detected by the sensors on the streamers, and this data is processed using various algorithms to determine the structure and composition of the subsurface.

It is important to know the locations of the various source and sensor components in order to properly define the area that is covered by the seismic survey and correctly determine the locations of the subsurface elements.

Appellant argues that Banbrook does not teach "an apparatus for use in a marine seismic survey" and "seismic survey object" since the word "seismic" does not appear in Banbrook.

Appellant first argues that Banbrook does not teach a seismic survey because it teaches using a submarine to tow the array. However, this argument is not valid for two reasons. First, Banbrook teaches towing the array with "a *surface ship* or a submarine". As shown in the Appellants own drawings (see Figs 1, 2, 4, 6, and 7), towing a seismic survey with a surface ship is known. Secondly, although it is less common, it is also known to use submarines in seismic surveying (see Svenning (5747754)).

Appellant next argues that Banbrook does not teach a seismic survey because it teaches a SONAR system. This is not a valid argument. Sonar and seismic devices/methods are classified in the same class and are very similar to each other.

Art Unit: 3663

Both use the same types of acoustic transducers to emit acoustic signals into the desired medium, and receive acoustic reflections using the same types of acoustic receivers. Similar types of data analysis are performed on the data in both cases. The only difference between seismic and SONAR is the type of objects or interfaces that the survey is designed to detect. Banbrook teaches using reflected acoustic signals detected at acoustic sensors to determine the position of a target, which may be a subsurface reservoir. This is the method and goal for a seismic survey.

Appellant further argues that Banbrook teaches a passive array. None of the independent claims require the use of a seismic source, nor do they make any mention of an active array. Limitations that are not part of the claim cannot be considered in the examination. With respect to the dependent claims which do require the presence of a seismic source, the Examiner will point out that this deficiency is supplied by Vandenbroucke. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify the system of Banbrook with the sources taught by Vandenbroucke since such a modification would have given more flexibility in the abilities of the surveying apparatus to survey over more varied, noisier, or more geographically complex environments.

Appellant argues that the art or record fails to teach all the limitations of the claims, namely that Banbrook does not teach "an apparatus for use in a marine seismic survey" and "seismic survey object". The Examiner asserts that Banbrook does in fact teach "an apparatus for use in a marine seismic survey" and "seismic survey object" as discussed above.

Art Unit: 3663

The Appellant argues that there is no reason to combine the Banbrook and Vandenbroucke references since both teach fully-functioning positioning systems.

However, one of ordinary skill in the art is a person with a PhD in geophysics with several years of experience.

Factors considered in ascertaining the level of ordinary skill in the art include:

- the types of problems encountered in the art – accurately determining the location of the acoustic sensors on the cables (Banbrook, Col 1, lines 60-64).
- the prior art solutions to these problems - these include acoustic triangulation (Banbrook, Col 1, lines 24-32); and magnetic heading calculations (Banbrook, Col 1, lines 33- 55).
- the rapidity with which innovations are made – the field is progressing at a fairly rapid pace, as shown by number of innovations recited in Banbrook (Col 1, line 24- Col 2, line 6).
- the sophistication of the technology involved – processing of seismic data is generally performed on a processor (Banbrook, Col 1, lines 25-32; Col 5, lines 11-26).

It would have been obvious to one of ordinary skill in the art of geophysics at the time of the invention to modify the system of Banbrook with the short baseline or ultrashort baseline acoustic positioning systems of Vandenbroucke since such a modification would have improved the accuracy of the locations determined for the survey components, thus improving the accuracy of the subsurface map created from the collected data. It is generally known in the art to combine multiple position determination devices within a single survey system to improve the accuracy of the positioning. As knowledge of the positions of the seismic apparatus is of utmost importance to the accuracy of the survey, it would have been obvious to one of ordinary

Art Unit: 3663

skill in the art to ensure the accuracy of the position determination by combining the teachings of both references to create an improved system.

The Appellant argues that Banbrook is outside the scope and content of the prior art because it is directed to a SONAR system. As explained above, SONAR and seismic systems are very similar in that they both detect acoustic reflections and use the data collected to produce a determination of the location of a target. Both types of systems fall in the same class, and use the same types of equipment. Thus the system of Banbrook is clearly within the scope and content of the prior art.

The Appellant again argues that there is no reason to combine the Banbrook and Vandenbroucke references. Appellant first argues that Banbrook does not teach a seismic survey system, there is not reason to combine it with Vandenbroucke, which does teach a seismic survey system. As discussed above, the sonar system of Banbrook is functionally equivalent to a seismic survey, and thus it would have been obvious to combine the two references to create an improved survey system. Secondly, the Appellant argues that since both Banbrook and Vandenbroucke teach fully-functioning positioning system there would be no motivation to combine the two. However, it would have been obvious to one of ordinary skill in the art of geophysics at the time of the invention to modify the system of Banbrook with the short baseline or ultrashort baseline acoustic positioning systems of Vandenbroucke since such a modification would have improved the accuracy of the locations determined for the survey components, thus improving the accuracy of the subsurface map created from the collected data. It is generally known in the art to combine multiple position

Art Unit: 3663

determination devices within a single survey system to improve the accuracy of the positioning. As knowledge of the positions of the seismic apparatus is of utmost importance to the accuracy of the survey, it would have been obvious to one of ordinary skill in the art to ensure the accuracy of the position determination by combining the teachings of both references to create an improved system.

The Appellant argues that there is no reasonable expectation of success of the asserted combination. Appellant's argument relies on the fact that both Banbrook and Vandenbroucke present complete position determination systems. However, as discussed above, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Banbrook to include the short baseline or ultrashort baseline system of Vandenbroucke since such a modification would have provided a useful redundancy and an improvement in the location accuracy. It is reasonable to expect that a combination of two functioning positioning systems would produce a third positioning system which would work at least as well, and probably better, than each individual system alone.

Appellant argues that claim 6 is unobvious over Banbrook in view of Vandenbroucke and Ambs for the reasons provided above, noting that Ambs does not supply the alleged deficiencies in Banbrook and Vandenbroucke. For the reasons outlined above, the Examiner respectfully disagrees.

Appellant argues that claims 9, 20, and 31 are unobvious over Banbrook in view of Vandenbroucke and Burke for the reasons provided above, noting that Burke does

Art Unit: 3663

not supply the alleged deficiencies in Banbrook and Vandenbroucke. For the reasons outlined above, the Examiner respectfully disagrees.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Krystine Breier/

Examiner, Art Unit 3663

/JACK KEITH/

Supervisory Patent Examiner, Art Unit 3663

Conferees:

Ian J. Lobo /ijl/

Brian Green /BKG/

Appeals Conference Specialist